Korean Journal of Life Science
Vol. 13. No. 2. 150~153, 2003

Control Effect of New Developed Insecticide on Two Spotted Spider Mite (*Tetranychus urticae* Koch) Collected from Commercial Roses

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Abstract

To determine the effect of newly developed insecticide on two spotted spider mite, *Tetranychus Urticae*, populations, ten leaf discs were sprayed with three different concentrations (0.5%, 1.0%, and 1.5%) of the tested insecticide solution, and with a water-sprayed control. The tested insecticide solution was toxic to adult female and immature of two spotted spider mite, but was relatively non-toxic to eggs. For equivalent concentrations, more adult females were killed than immature stages. There was no marked difference between the hatch of treated and untreated eggs, although a weak trend between the numbers of unhatched eggs and the insecticide concentration after 7 days is shown.

Key words – Two spotted spider mite, *Tetranychus urticae*, mititicide, mite control

Introduction

A wide range of wild and cultivated plants are attacked by two spotted spider mite (TSSM), *Tetranychus urticae* Koch. For a long time, TSSM is a very serious pest in tomato crops, and cause a major problem on the members of the Solanaceae family such as eggplant and Irish potato[2,3]. The pest also occurs in citrus and cotton, and can be found on ornamentals such as roses [7]. Among the reported wild-occurring host plants are apple of Peru (*Nicandra physaloides*) and Castor bean (*Ricinus communis*)[2,4]. Because of their great reproductive capacity, they are able to destroy plants within a short period of time. When left uncontrolled the farmer can lose his production within a week time.

In Korea, TSSM is an economically important pest of greenhouse roses, which are the most important cut flower crop grown for the local and international markets. Over the past ten years, a major changes in the production systems of rose as cut flowers has been initiated in Korea[1]. At present, the most popular growing method is the arching method originated in Japan[5]. This changes in crop production systems profoundly influences ecology and dynamics of pests. Recognizing the importance of change of crop production system and understanding its role is essential in the development and implication of effective pest management. TSSM populations on dense foliage, continuously existing during the seasons, in the arching method can serve as an infestation source, because the plants are never pruned or cut backed. Thus, it may be necessary to monitor the TSSM population frequently in the arching method. The dense foliage in the arching method, moreover, can play a role of the protective shield for

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TSSM against miticide[1].

For many years, farmers have used various insecticides and miticides to control TSSM without any special precaution of chemical doses and quantity. According to the reckless of chemical uses, the resistance of TSSM against most of insecticides and miticides seriously increased. For the aforementioned aspect on pest problems with chemicals, a new insecticide was formulated in our laboratory to control insect pests including mites, and it was a mixture of environmentally friendly material including vegetable oil, glycerol and vinegar, etc. In this study, we carried out to find out the effect of newly developed insecticide, which was formulated with non toxic and environmentally friendly chemicals, on TSSM control.

Materials and Methods

Two spotted spider mites were collected from a commercial rose crops in a green house farm at Kimhae, Kyungnam, Korea, and were multiplied and incubated on kidney beans (*Phaseolus vulgaris* var. *humillis* Alefeld) in the laboratory during the studying period. Leaf discs of 18 mm diameter were punched from bean leaves supporting vigorous colonies of Two spotted spider mite and placed upper surface down on damp cotton wool in petri dishes. Pre-treatment counts of adult females, immatures (nymphs, larvae and adult males) and eggs were made.

The experiment compared three concentrations (0.5%, 1.0%, and 1.5%) of the tested insecticide solution and a water-sprayed control. Ten leaf discs were sprayed for each treatment. The discs were sprayed in a clean bench, and 3ml of spray was applied to each petri dish containing leaf discs.

Treated leaf discs were held at 23℃, 65~75% RH in a 16:8 light-dark photoperiod. Post-treatment counts of adult and immature survival were made at 24 and 48 hours after treatment. Egg hatch was assessed at 7 and 9 days after treatment.

The effectiveness of each treatment (reduction compared with the control) was calculated using the following formula.

$$\% \text{ control} = 100 \times (1 - (Ta \times Cb / Tb \times Ca))$$

Where Ta was the number remaining on the treated discs after treatment, and Tb, the number present on the treated discs before treatment. Ca was the number remaining on the control discs after treatment, and Cb was the number present on the control discs before treatment.

Results and Discussion

The mean number of adult females and immature mites per leaf disc and the percentage control calculated for each treatment after 24 and 48 hours are shown in Tables 1 and Table 2. And, the mean number of eggs

Table 1. The effect of various concentrations of the tested insecticide on adult female of two spotted spider mite.

Treatment	NT	Mites per leaf disc (% Control)		
		Pre-treatment	24 hrs	48 hrs
1.5%	120	12.0	0.8 (93.0)	0.6 (94.4)
1.0%	117	11.7	1.2 (89.3)	0.8 (92.3)
0.5%	103	10.3	5.7 (42.1)	4.6 (49.9)
Control	110	11.0	10.5	9.8

NT = Total Number Tested.

Table 2. The effect of various concentrations of the tested insecticide on immature of two spotted spider mite eggs.

Treatment	NT	Mites per leaf disc (% Control)		
		Pre-treatment	24 hrs	48 hrs
1.5%	78	7.8	2.3 (67.7)	1.3 (80.2)
1.0%	65	6.5	3.8 (36.1)	2.2 (60.0)
0.5%	70	7.0	5.3 (17.2)	3.8 (37.3)
Control	70	7.0	6.4	5.9

NT = Total Number Tested.

Table 3. The effect of various concentrations of the tested insecticide on the hatching of two spotted spider mite.

Treatment	NT	Mites per leaf disc		
		Pre-treatment	7 days	9 days
1.5%	210	21.0	43.6	48.3
1.0%	157	15.7	30.7	50.4
0.5%	211	21.1	40.9	56.2
Control	303	30.3	54.1	62.8

NT = Total Number Tested.

per leaf disc and the percental hatchability in each treatment after 7 and 9 days are shown in Table 3.

The tested insecticide solution was toxic to adult female and immature of two spotted spider mite, but was relatively non-toxic to eggs. For equivalent concentrations, more adult females were killed than immature stages (Tables 1 and 2). This was probably due to the habits of immatures sheltering under the web produced by the Two spotted spider mites and thereby minimizing contact with spray droplets. By contrast, adult females move more frequently over the surface of the webbing. Close examination of the leaf discs immediately after spraying showed that deposition of spray droplets on the leaf surface was greatest for the insecticide solutions and virtually non-existent for water alone. However, no visual differences among the different insecticide concentrations could be detected. It was also noticed that many mites were immediately immobilized by the insecticide solutions whereas mites on water-treated discs were as active as usual.

Mortality in all insecticide treatments also increased slightly over time. The greatest percentage increases between 24 and 48 hours were recorded for the two lower insecticide concentrations against immatures (Table 2).

There was no marked difference between the hatchabilities of treated and untreated eggs. Although a weak trend between the numbers of unhatched eggs and the insecticide concentration after 7 days is shown. In Table 3, it is possible that eggs like immature of two spotted spider mite were also protected to some extent by webbing on the leaf surface. However, it is more likely that eggs are less susceptible than adults as Osborne and Petitt[6] also found a greater proportion of eggs hatched when treated with 1.25% solution of Safers insecticidal soap. Overall, it is concluded that satisfactory control of two spotted spider mite using the tested insecticide solutions, would be possible. To achieve control,

through coverage of the undersides of leaves would be essential and repeat applications would be required on established populations when large number of eggs are present. It is recommended these insecticide solutions should not be mixed with other pesticides since the pH of these solutions was measured at 5.3~5.9, and phytotoxicity could also be a problem on susceptible plants.

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(Received December 16, 2002; Accepted April 17, 2003)

초록 : 장미에서 채집된 점박이 응애 (*Tetranychus urticae* Koch)에 대한 신규 살충제의 방제 효과

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현재 각 종 작물에 큰 피해를 주고 있는 점박이 응애 (*Tetranychus urticae* Koch)의 밀도를 줄이기 위해 새로 개발된 살충제를 각 처리농도별로 (0.5%, 1.0%, 1.5%) 응애가 접종된 콩잎 디스크에 살포하여 살충 효과를 검정하였으며, 대조구로서 증류수만을 살포한 콩잎 디스크와 비교하였다. 공시 살충제의 살충효과는 점박이 응애 성충의 암컷과 약충에는 탁월하였으나, 알에는 비교적 효과가 낮았다. 동일 처리 농도별 성충과 약충의 살충 효과를 비교하였을 때, 성충의 살충률이 약충의 살충률보다 높았다. 또한, 약제 처리구와 대조구 간의 알의 부화율에 있어서는 유의적인 차이가 없었다.